add A1

That which is claimed is:

1. Tuning apparatus for a stringed musical instrument comprising a body and a neck extending outwardly from said body, a plurality of strings extending from said body to said neck, means for forming a first critical point for each of said strings on said neck, means for forming a second critical point for each of said strings on a fulcrum tremolo, said fulcrum tremolo includes a base plate, said base plate being pivotally mounted about a fulcrum axis extending transversely of said strings for changing the pitch of all said strings at one time as said base plate is pivoted, separate means for mounting each of said strings on said base plate and for raising and adjusting the tension of said strings from an untensioned condition to a proper playing pitch including means for varying the spacing between said first and second critical points for changing the harmonic tuning, wherein the improvement comprises that each of said separate means for mounting each of said strings has a bridge element forming said second critical point and a string holder means on opposite side of said bridge element from said first critical point disposed in a variably spaced relation to said second critical point over which each of said string extends.

5,986,191

2. Apparatus as set forth in claim 1 wherein said separate means has a sleeve-like member, said sleeve-like member has a first portion closer to said second critical point and a second portion more remote from said second critical point, said sleeve-like member includes a restricted interior portion between said first and second ends thereof, said string holder means has a first end closer to said bridge element and a second end more remote from said bridge element, said string holder means is displaceable between a first limiting position and a second limiting position and the first end of said string holder means is in spaced relation from said bridge element in and between said first and second limiting positions, and said restricted portion so arranged to receive said

separate means operable to impede rotation of said sleeve-like member in one direction without additional means.

3. Apparatus as set forth in claim 2 wherein string holder means has a string passageway extending from the first end thereof toward the second end, said string arranged to extend through said string passageway and secured to said string holder means at said second end.

4. Apparatus as set forth in claim 3 wherein said string holder means has a threaded portion extending in the direction of the first end from said second end of said string holder means, said string holder means has a string clamping means extending from said first end of said string holder means towards said threaded portion, and said string holder displacement means comprising an bolt-like member adjustably mounted in said separate means and arranged to threadedly engage said string holder means for displacing said string holder means between said first and second limiting positions.

5. Apparatus as set forth in claim 4 wherein said string clamping means has a fork-like slotted string passageway extending from said threaded portion to said first end of said string holder means, said string clamping means including a clamping point at first end of said string holder means, said fork-like slotted string passageway has a lower fork closer to said base plate and an upper fork more remote from said base plate, said string clamping means has a annular flange-like portion in bearing contact with said restricted interior portion of said sleeve-like member, said string arranged to extend through said string passageway between said upper and lower forks, wherein as said string holder means is displaced in and between said first and second limiting positions for macro-tuning said string, said upper and lower forks are simultaneously displaced towards said string within said restricted interior portion for anchoring said string at said clamping point.

6. A stringed musical instrument comprising an elongated neck and body attached to one end of the said neck, a tremolo device mounted on said body, a plurality of elongated strings, means on said neck for supporting and forming a first critical point for each of said strings, said tremolo device forming a support for and second critical point for each of said strings, said tremolo device comprising a fulcrum tremolo, said fulcrum tremolo including bearing means mounted on said body and supporting said fulcrum tremolo for pivotal displacement, said bearing means comprises at least one ball bearing and at least one bearing housing for adjustably positioning said bearing means relative to said body and at least one shaft is connected to said base plate through said ball bearing wherein the improvement comprises an annular flange on said shaft which spaces said bearing means away from said base plate.

7. A stringed musical instrument comprising an elongated neck and body attached to one end of the said neck, a fulcrum tremolo mounted on said body, a plurality of elongated strings, means on said neck for supporting and forming a first critical point for each of said strings, said fulcrum tremolo forming a support for and second critical point for each of said strings, said fulcrum tremolo including counter springs with a first end closer to said second critical point and a second end further from said second critical point, said first end of said counter springs connected to said body and said second end of said counter springs connected to an attachment means on said fulcrum tremolo for counter balancing the tension of said elongated strings wherein the improvement comprises that said attachment means includes a separate means for globally tuning said fulcrum tremolo.

8. Apparatus as set forth in Claim 9 wherein said separate means comprises a spring holder means disposed in spaced relation between said first end of said counter springs and said attachment means.

9. Apparatus as set forth in claim 8 wherein said spring holder means is displaceable between a first limiting position and a second limiting position and said spring holder means is in spaced relation from said attachment means in and between said first and second limiting positions.

10. Apparatus as set forth in claim 9 wherein said attachment means has a threaded passageway extending in the direction of said spring holder means, said spring holder means has a threaded passageway extending in the direction of said counter springs and an unthreaded passageway extending in the direction of said attachment means, and said string holder displacement means comprises a thumb screw-like member arranged with a first threaded portion extending in the direction of said counter springs and a second threaded portion extending in the direction of said attachment means.

11. Apparatus as set forth in Claim 10 wherein said first threaded portion of said thumb screw-like displacement means is threadedly engaged with said threaded passageway of said spring holder means and said second threaded portion of said thumb screw-like displacement means is threadedly engaged with said threaded passageway of said attachment means for displacing said string holder means in and between said first and second limiting positions.

12. Apparatus as set forth in claim 11 wherein said attachment means has a pin extending in the direction of said spring holder means and said pin passes through said unthreaded opening of said spring holder means for limiting the rotation of said spring holder means about said thumb screw-like displacement means.

13. In a stringed musical instrument, means for locking and tensioning at least one string from an untensioned condition to a tuned pitched

condition at one end of the neck of a stringed musical instrument, said means comprising a string locking means for said at least one string, a bracket secured to said one end of said neck, a lever pivotally secured to said bracket, said string locking means secured to said lever, said lever is L-shaped comprising a first lever arm extending angularly from a second lever arm and said lever arms secured together at an intersecting section and a pivot pin extending through said intersecting section and said bracket for pivoting and securing said lever to said bracket, a locking clamp for adjustably securing said second lever arm to said bracket, said first lever arm has a free end spaced from said intersecting section, wherein the improvement comprises that said first lever arm includes an string holder means for securing and macro-tuning said at least one string.

14. A tuning apparatus for a stringed musical instrument, a plurality of strings extending over said stringed musical instrument, each of said strings having a first end and a second end, each of said first end of said strings having a first anchoring means on a first section of said stringed musical instrument and each of said strings having a second anchoring means on a second section of said stringed musical instrument, separate means for raising and adjusting the tension of at least one string from an untensioned condition to a tuned pitched condition, wherein the improvement comprises that said separate means has a string securing means including said first anchoring means for macro-tuning said at least one string.

15. Apparatus as set forth in claim 14, wherein said string securing means has a first end closer to said second anchoring means and a second end further to said second anchoring means, said string securing means is displaceable between a first limiting position and a second limiting position and the first end of said string securing means is in spaced relation from said second anchoring means and in between said first and

second limiting positions.

16. Apparatus as set forth in claim 15 wherein each said separate means includes a sleeve-like member with a first section closer to said second anchoring means and a second section closer said second anchoring means, said first end of said string securing means has a string passageway closer to said second anchoring means extending in the direction between said first and second ends thereof, said string securing means has a threaded portion further from said second anchoring means extending in the direction between said first and second ends thereof, and said string securing displacement means comprising an bolt-like member adjustably mounted in said sleeve-like member and arranged to threadedly engage said string securing means for displacing said string securing means in and between said first and second limiting positions.

17. Apparatus as set forth in claim 16, wherein said sleeve-like member has a first slot arranged in said first section thereof, a first side of said sleeve-like member associated with said first slot, said string securing means has a fork-like string passageway extending from said first end thereof towards said second end of said string securing means, said fork-like string passageway means has a upper fork closer to said first slot and an lower fork more remote from said first slot, said upper fork has an unthreaded passageway transverse the direction of said fork-like passageway, said lower fork has a threaded passageway transverse the direction of said fork-like passageway, said upper and lower forks are displaceable between an open position and a closed position.

18. Apparatus as set forth in claim 17, wherein said upper and lower fork displacement means comprising a thumb screw-like member adjustably arranged to pass through said first slot of said sleeve-like member, through said unthreaded passageway of said upper fork and threadedly

engage said threaded passageway of said lower fork for displacing said upper and lower forks in and between said open and closed positions towards said string for clamping and securing said at least one string.

19. Apparatus as set forth in claim 18, wherein said sleeve-like member has a second slot extending from said first section of said sleeve-like member towards said second section thereof adjacent said fork-like string passageway and continuing disposed at an angle towards said first side of said sleeve-like member associated with said first slot wherein said at least one string is arranged to extend through said second slot and into said fork-like string passageway between said upper and lower forks.

20. Apparatus as set forth in claim 13 wherein string holder means for securing and macro-tuning said at least one string is said string securing means for macro-tuning said at least one string as set forth in claim 14.

21. Apparatus as set forth in claim 16, wherein said sleeve-like member includes a restricted portion between first and second section thereof, said string securing means has a string passageway extending from the first end thereof toward the second end, said string arranged to extend through said string passageway and secured to said string securing means, said string securing means includes a string clamping means, said string clamping means in and between said first and second ends of said string securing means, said string clamping means has a fork-like slotted string passageway extending from said threaded portion to said first end of said string securing means, said string clamping means including a clamping point at first end of said string securing means, said fork-like slotted string passageway has a first fork and second fork, said string clamping means has a annular flange-like portion in bearing contact with said restricted portion of said sleeve-like member, said string arranged to extend through said string passageway and between said first and second forks, wherein as said string clamping

means is displaced in and between said first and second limiting positions said first and second forks are displaced within said restricted portion of said sleeve-like member for securely clamping said string at said clamping point.

22. Apparatus as set forth in claim 18 is part of a tremolo device wherein said first end of said string securing means is as close as possible to said second critical point.

23. A fulcrum tremolo for a stringed musical instrument having a head engaging the first end of the strings, the tremolo comprising:
a base plate pivotable about a pivot axis;
a string anchor engaging the second end of one of the strings;
a bridge element connected to the base plate, pivotable about the pivot axis, engaging the one string intermediate the string anchor and the head;
a macrotuner connected to the base plate rearward of the bridge so that the macrotuner is pivotable about the pivot axis, the macrotuner being operable to adjust the string from an untensioned pitch to a proper playing pitch, the macrotuner comprising:
an elongated arm extending rearwardly adjacent the bridge element; and
a gripping portion intermediate the bridge and the string anchor for gripping the string.

24. The tremolo of claim 23 wherein the tremolo comprises a ball bearing and the base plate is pivotable about the base plate.

25. A fulcrum tremolo for a stringed musical instrument having a head engaging the first end of the strings, the tremolo comprising:
a base plate pivotable about a pivot axis;
a string anchor engaging the second end of one of the strings;

a bridge element connected to the base plate, pivotable about the pivot axis, engaging the one string intermediate the string anchor and the head;

a macrotuner rearward of the bridge, operable to adjust the string from an untensioned pitch to a proper playing pitch, the macrotuner comprising:

a gripping portion intermediate the bridge and the string anchor for gripping the string.

26. The tremolo of claim 25 wherein the macrotuner is connected to the base plate so that the macrotuner is pivotable about the pivot axis.

27. The tremolo of claim 25 wherein the macrotuner comprises an elongated arm extending rearwardly adjacent the bridge element.

28. The tremolo of claim 25 wherein the tremolo comprises a ball bearing and the base plate is pivotable about the base plate.

29. A fulcrum tremolo operable with a musical instrument having a body and a plurality of strings in a tensioned state connected to the body, the tremolo comprising:

a base mounted to the body, pivotable about a fulcrum axis, wherein the tension in the strings tends to pivot the base in a first direction about the fulcrum axis;

a tremolo arm operable to pivot the base about the fulcrum axis to create a tremolo effect;

a biasing element connected to the body wherein the biasing force of the biasing element tends to pivot the base in a second direction against the tendency of the base to pivot the base in a first direction in response to the tension in the strings; and

an adjustment mechanism disposed between the biasing element and the base, operable to adjust the biasing force of the biasing element.

30. The device of claim 29 wherein the base includes an elongated arm and the adjustment mechanism operates to vary the distance between the arm and the biasing element.

31. The device of claim 29 comprising a block connected to the biasing element and an elongated arm connected to the base, wherein the adjustment mechanism threadedly engages at least one of the block and the elongated arm.

32. The device of claim 30 comprising an alignment element operable to impede rotation of the block in at least one direction relative to the elongated arm.

33. A tremolo operable with a musical instrument having a body and a plurality of strings in a tensioned state, connected to the body, the tremolo comprising:

a base mounted to the body, pivotable about a fulcrum axis, wherein the tension in the strings provide a force in a first direction that tends to pivot the base in a first direction about the fulcrum axis;

a tremolo arm operable to pivot the base about the fulcrum axis to create a tremolo effect;

a counter balance producing a force in a second direction to counter balance the string tension force to establish an equilibrium point of rotation of the base;

an adjustment mechanism operable to adjust the equilibrium point of rotation of the base.

34. The device of claim 33 wherein the adjustment mechanism varies the counter balance force.

35. The device of claim 33 wherein the base includes an elongated arm and

the adjustment mechanism operates to vary the distance between the arm and the counter balance.

36. The device of claim 33 comprising a block connected to the biasing arm and an elongated arm connected to the base, wherein the adjustment mechanism threadedly engages at least one of the block and the elongated arm.

37. The device of claim 35 comprising an alignment element operable to impede rotation of the block in one direction relative to the elongated arm.

38. A tremolo operable with a musical instrument having a body and a plurality of strings in a tensioned state, connected to the body, the tremolo comprising:
a base mounted to the body, pivotable about a fulcrum axis;
a tremolo arm manually operable to pivot the base about the fulcrum axis to produce a tremolo effect;
a tuning element connected with the base operable to simultaneously vary the tension in each of the strings.

39. A tremolo operable with a musical instrument having a body and a plurality of strings in a tensioned state, connected to the body, the tremolo comprising:
a base mounted to the body, pivotable about a fulcrum axis;
a tremolo arm manually operable to pivot the base about the fulcrum axis to produce a tremolo effect;
a ring bearing rotatably supporting the base; and
a vertical adjustment for vertically displacing the base, wherein the vertical adjustment is located parallel or forward of the pivot axis.